

REMARKS/ARGUMENTS

Claims 7 and 13-16 are canceled by this response. Claim 17 is added. Accordingly, claims 6, 8-12, and 17 remain pending in the instant application.

Embodiments in accordance with the present invention relate to endpoint detection for a plasma process utilized in the fabrication of semiconductor devices. Conventionally, endpoint of such processes was detected by sensing a change in composition of chamber exhaust:

[c]onventionally, an endpoint detection apparatus is positioned in the chamber exhaust line directly downstream of the throttle valve. Such an endpoint detection cell may comprise a cathode positioned with a space defined by cell walls that serve as an anode. Application of a potential difference between the cathode and the cell walls triggers an electrical discharge. The character of light resulting from interaction between the electrical discharge and gases present in the endpoint detection apparatus can be detected to measure endpoint. (Emphasis added; page 6, lines 11-17)

Such conventional endpoint detection apparatuses may, however, be inaccurate due to unwanted build-up of residue material on exposed surfaces of the detection cell. This residue can in turn deleteriously affect the strength of the electrical discharge, and stability and intensity of the optical signal. (Page 1, lines 24-26)

Accordingly, in an embodiment of method of endpoint detection in accordance with an embodiment of the present invention, an endpoint detector is selectively in fluid communication with the chamber exhaust through a valve:

[d]uring initial and midpoint stages of the chamber cleaning process, isolation valve 112 is closed by controller 120 to ensure that the flow of chamber exhaust through throttle valve 108 does not reach endpoint detection apparatus 110. As illustrated below, this is beneficial because effluent from the chamber during early and intermediate cleaning stages may contain high concentrations of materials that could reform on exposed surfaces of endpoint detection apparatus 110, degrading the accuracy of endpoint detection. (Emphasis added, page 6, line 31 - page 7 line 2)

Pending independent claim 6 accordingly recites:

6. A method of detecting an endpoint of a plasma based semiconductor fabrication process, the method comprising:
providing an endpoint detector;
isolating the endpoint detector from exposure to an exhaust of a plasma based semiconductor fabrication process during an initial stage of the process; and
exposing the endpoint detector to exhaust from the process during a later stage of the process. (Emphasis added)

The Examiner has rejected the pending claims as either anticipated by U.S. patent no. 5,879,574 to Sivaramakrishnan et al. ("the '574 patent"), or obvious in light of the '574 patent in combination with other references, including U.S. patent no. 5,986,747 to Moran ("the Moran patent") and U.S. patent no. 5,472,561 to Williams et al. ("the Williams patent"). These claim rejections are traversed as follows.

As a threshold matter, the Examiner is reminded that for anticipation rejections under 35 U.S.C. 102:

the claim is anticipated by the reference. No question of obviousness is present. In other words, for anticipation under 35 U.S.C. 102, the reference must teach every aspect of the claimed invention either explicitly or impliedly. Any feature not directly taught must be inherently present. (Emphasis added; MPEP 706.02).

Here, there is no teaching or even suggestion in the '574 patent, or any of the patents relied upon by the Examiner, to selectively expose an endpoint detector to exhaust from later stages of a plasma based semiconductor fabrication process. As acknowledged by the Examiner, the '574 patent focuses upon detecting endpoint of a plasma-based process for cleaning residue from an empty chamber:

Providing a *processing chamber* 15 for performing a deposition of [sic] etching process on a wafer supported on a support member 25, wherein the process chamber is configured to receive plasma species from a remote plasma source 55 after the wafer is removed from the process chamber (Original italics, underlining added; Office Action mailed September 20, 2004, page 2, lines 7-11)

In fact, the '574 patent actually teaches away from exposing an endpoint detector to exhaust from a semiconductor fabrication process:

bypass line 804 may include a control valve 806 to vary the amount of flow passing through line 804, or to completely cease gas flow along bypass line 804, for example, during gas processing of a wafer within the chamber. (Emphasis added; col. 38, lines 64-67)

Because the '574 patent fails to teach every aspect of the pending claims, it is respectfully asserted that they cannot be considered anticipated by this reference. Continued assertion of the anticipation rejections is improper, and the claim rejections should be withdrawn.

The pending claims also cannot be considered obvious in light of the '574 patent. Specifically, neither the Moran nor the Williams patents relied upon by the Examiner do nothing to supply the teaching so conspicuously lacking from the '574 patent.

The Moran patent describes only an endpoint detector cell with a valve allowing exhaust from a processing chamber to be sampled. This reference says nothing to teach, or even suggest, a method wherein an endpoint detection cell is selectively exposed to exhaust in a later stage of a semiconductor fabrication process.

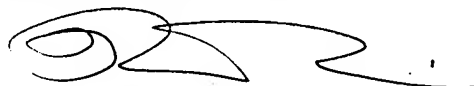
As for the Williams patent, this reference describes only an architecture for a RF endpoint detection monitor. It says nothing to teach or suggest selective exposure of such a structure to chamber exhaust at a later stage of a semiconductor fabrication process.

Because the reference combinations relied upon by the Examiner fail to teach or suggest every element of the pending claims, it is respectfully asserted that the claims cannot be considered obvious in light of those references. Continued assertion of the obviousness rejections is improper, and these claim rejections should be withdrawn.

Claim 17 has now been added to recite a method wherein an endpoint detector is exposed to exhaust by an isolation valve controlled by a controller. Support for this new claim may be found in the application as originally filed, at least in original claim 5 and at page 8, lines 16-19.

In view of the foregoing, Applicants believe all claims now pending in this Application are in condition for allowance. The issuance of a formal Notice of Allowance at an early date is respectfully requested. If the Examiner believes a telephone conference would expedite prosecution of this application, please telephone the undersigned at 650-326-2400.

Respectfully submitted,



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